

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US04/018364

International filing date: 10 June 2004 (10.06.2004)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/506,752
Filing date: 30 September 2003 (30.09.2003)

Date of receipt at the International Bureau: 19 August 2004 (19.08.2004)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

1211274

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

August 12, 2004

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: 60/506,752
FILING DATE: *September 30, 2003*
RELATED PCT APPLICATION NUMBER: *PCT/US04/18364*

Certified by



Jon W Dudas

Acting Under Secretary of Commerce
for Intellectual Property
and Acting Director of the U.S.
Patent and Trademark Office

17607 U.S. PTO

Please type a plus sign (+) inside this box 

PTO/SB/16 (02-01)
Approved for use through 10/31/2002. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

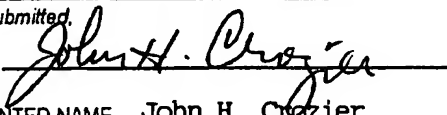
Express Mail Label No. 

15535 U.S. PTO
60/506752
09/30/03

INVENTOR(S)					
Given Name (first and middle (if any))	Family Name or Surname	Residence (City and either State or Foreign Country)			
Frank	Morton	Harwinton CT			
<input type="checkbox"/> Additional inventors are being named on the ___ separately numbered sheets attached hereto					
TITLE OF THE INVENTION (280 characters max)					
ANTI-BACKLASH NUT ASSEMBLY FOR A LEAD SCREW					
Direct all correspondence to: CORRESPONDENCE ADDRESS					
<input checked="" type="checkbox"/> Customer Number 21091		<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Place Customer Number Bar Code Label here </div>			
OR Type Customer Number here					
<input type="checkbox"/> Firm or Individual Name					
Address					
Address					
City		State		ZIP	
Country		Telephone		Fax	
ENCLOSED APPLICATION PARTS (check all that apply)					
<input checked="" type="checkbox"/> Specification Number of Pages 7		<input type="checkbox"/> CD(s), Number 			
<input checked="" type="checkbox"/> Drawing(s) Number of Sheets 2		<input type="checkbox"/> Other (specify) 			
<input type="checkbox"/> Application Data Sheet. See 37 CFR 1.76					
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT					
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.					FILING FEE AMOUNT (\$)
<input type="checkbox"/> A check or money order is enclosed to cover the filing fees					
<input type="checkbox"/> The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 					
<input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.					
The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.					
<input checked="" type="checkbox"/> No.					
<input type="checkbox"/> Yes, the name of the U.S. Government agency and the Government contract number are: _____					

Respectfully submitted,

SIGNATURE



TYPED or PRINTED NAME

John H. Crozier

TELEPHONE

(203) 375-9118

Date

09/ 26/ 03

REGISTRATION NO.

(if appropriate)

Docket Number:

30,371

226-147

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the complete provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C. 20231.

PATENT

226-147

5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re

10

UNITED STATES PROVISIONAL PATENT APPLICATION

Of

15

Frank Morton

20

Relating to

25

ANTI-BACKLASH NUT ASSEMBLY FOR A LEAD SCREW

BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention relates to leadscrews generally and, more particularly, but not by way of limitation, to a novel anti-backlash nut for a leadscrew.

Background Art

10 Many modern linear devices require very precise movement. Systems that employ a leadscrew/nut configuration will exhibit some backlash between the two elements. Assemblies to eliminate this backlash can be complex and difficult to manufacture.

15 A common method to load two nut assemblies onto the leadscrew and force them apart by means of a spring or the like. This creates excess added drag on the system and offers a limited "zone" of anti-backlash, meaning the spring must be matched for the load. Some systems employ a torsion spring to load the two nut assemblies against each other. This helps to reduce the matching of the spring to the load that was required with the first system described. These torsion systems employ a collar to capture the two nut halves or a friction disk between
20 the two nut halves. This is an additional part that can be eliminated.

Accordingly, it is a principal object of the present invention to provide an anti-backlash nut assembly that eliminates the additional part.

It is another object of the invention to provide such an antibacklash nut assembly that consists of two or three parts.

25 It is a further object of the invention to provide such an antibacklash nut assembly that is tolerant of various assembly torques.

It is an additional object of the invention to provide such an antibacklash nut assembly that is quick and easy to assemble.

It is yet another object of the invention to provide such an antibacklash nut

ANTI-BACKLASH NUT ASSEMBLY FOR A LEADSCREW
Inventor: Frank Morton

PATENT
226-147

assembly that is compact in size and can thus be fit inside the rotor bushing of a linear actuator.

5 Other objects of the present invention, as well as particular features, elements, and advantages thereof, will be elucidated in, or be apparent from, the following description and the accompanying drawing figures.

BRIEF DESCRIPTION OF THE DRAWING

Understanding of the present invention and the various aspects thereof will be facilitated by reference to the accompanying drawing figures, provided for purposes of illustration only and not intended to define the scope of the invention, on which:

Figure 1 is a side elevational view, in cross-section, of one embodiment of the present invention.

Figure 2 is a side elevational view, in cross-section, of another embodiment of the present invention.

Figure 3 is a side elevational view, in cross-section, of a further embodiment of the present invention.

Figures 4(a) and 4(b) are isometric views of alternative arrangements of spring anchoring means.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference should now be made to the drawing figures on which similar or identical elements are given consistent identifying numerals throughout the various figures thereof, and on which parenthetical references to figure numbers, when used, direct the reader to the view(s) on which the element(s) being described is (are) best seen, although the element(s) may be seen on other figures also.

Figure 1 illustrates one embodiment of the present invention. Here, two nut assemblies 10 (antibacklash) and 12 (drive) are made with complementary shallow angles 14 formed at their distal ends where they meet. Nuts 10 and 12 are held in position relative to each other by means of a torsion spring 20 attached, by suitable means, to the nuts at 22 and 24, respectively, such as by inserting ends of the spring into channels formed in the nuts. The angle of interface 14 can vary, but approximately 30° yields good results and provides the friction to keep them aligned with each other. Torsion spring 20 may also be stretched to a desirable degree to provide a higher friction force. As nuts 10 and 12 are threaded together on a lead screw 30, the faces thereof push against each other and load the nut threads against the thread of the leadscrew in opposing directions.

In assembly, one of nuts 10 and 12 is threaded onto leadscrew 30. Then the other of nuts 10 and 12 is threaded onto the leadscrew, with the tapers facing each other. Next, torsion spring 20 is securely attached to one of nuts 10 and 12 and is "wound up" to create a load and then is securely attached to the other of the nuts. This keeps threaded nuts 10 and 12 in position relative to each other. The friction of the tapered surfaces on nuts 10 and 12 keeps the nuts from moving relative to each other.

This mechanism is also adjustable in that torsion spring 20 can be turned more (wound up more) to create a higher preload force. There may be multiple holes defined around the outsides of nuts 10 and 12 where ends of torsion spring

20 can be captured.

There are other embodiments of this device where one nut may extend around the outside diameter of the torsion spring and have the torsion spring attached to the opposite end of the housing. This provides a torsion load by the torsion spring as well as a slight compression load to increase the friction force on the tapered surfaces of the nuts. By biasing the two nut portions against the leadscrew threads, the backlash in the threads is removed. This assembly, by virtue of being preloaded with the spring will also compensate for wear of the nut and leadscrew interface.

Figure 2 illustrates another embodiment of the present invention. Here, as was the case with the embodiment shown on Figure 1, nuts 10 and 12 are threaded onto a lead screw 30 and their distal ends meet at an interface 14. In this case, spring 20 is wound on the outside of nuts 10 and 12 and the ends thereof are anchored in the nuts at 22 and 24, respectively. The action of spring 20 in this case is the same as described with reference to Figure 1, except that the spring extends over nut 12, as well as over nut 10.

Figure 3 illustrates a further embodiment of the present invention shown without a lead screw. A torsion spring 20 encircles antibacklash nut 10 and can be molded into the antibacklash nut or it may be adhesively attached thereto. Antibacklash nut 10 meets drive nut 12 at interface 14. Openings 22 and 24 are provided for anchoring torsion spring 20, if the torsion spring is not adhesively attached to antibacklash nut 10. A thermoplastic main drive nut 30 may be molded into metallic drive nut 12. Spaces 40 are provided at one end of drive nut 12 to accommodate one end of a lead screw (not shown). Bearing journals 50 are provided on the exterior surface of drive nut 12.

Figure 4(a) illustrates one method of anchoring a spring. Here, an antibacklash nut 100 has defined in one end thereof an opening 102 for the insertion therein of an end 104 of a torsion spring 106.

Figure 4(b) illustrates another method of anchoring a spring. Here, an antibacklash nut 100 has defined therein an L-shaped opening 102 to accommodate therein the insertion of an end 104 of a torsion spring 106. The ID of the rotor bushing (not shown) keeps spring 106 from disengaging and the L-shaped opening 102 secures the spring axially.

In the cases shown on Figures 4(a) and 4(b), the spring is separate, thus eliminating having to mold the spring into the antibacklash nut and the assembly consists of three parts – the rotor bushing with main drive nut, the antibacklash nut, and a torsion spring.

In the embodiments of the present invention described above, it will be recognized that individual elements and/or features thereof are not necessarily limited to a particular embodiment but, where applicable, are interchangeable and can be used in any selected embodiment even though such may not be specifically shown.

Spatially orienting terms such as “above”, “below”, “upper”, “lower”, “inner”, “outer”, “inwardly”, “outwardly”, “vertical”, “horizontal”, and the like, when used herein, refer to the positions of the respective elements shown on the accompanying drawing figures and the present invention is not necessarily limited to such positions.

It will thus be seen that the objects set forth above, among those elucidated in, or made apparent from, the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown on the accompanying drawing figures shall be interpreted as illustrative only and not in a limiting sense.

